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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/993,970	11/16/2001	Peter J. McGuinness	01-LJ-020	9016

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EXAMINER
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MARIAM, DANIEL G

ART UNIT	PAPER NUMBER
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2621

DATE MAILED: 11/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<p align="center"><b>Office Action Summary</b></p>	<b>Application No.</b> 09/993,970	<b>Applicant(s)</b> MCGUINNESS ET AL.	
	<b>Examiner</b> DANIEL G MARIAM	<b>Art Unit</b> 2621	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5, 9-13 and 17-21 is/are rejected.
- 7) ☒ Claim(s) 6-8, 14-16 and 22-24 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |                                                                                                                                              |                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                                                  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                                         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)            |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>3/25/2002</u> | 6) <input type="checkbox"/> Other: ____                                                |

## DETAILED ACTION

### *Claim Objections*

1. Claim 1 recites the limitation “a plurality of initial image correlators, wherein each initial image correlator within the plurality of initial image correlators is communicatively coupled with at least one of the image feature detectors within the plurality of image feature detectors”.

However, neither the specification nor the drawings show a plurality of initial correlators. Only a cursory of this feature is mentioned on page 6, lines 25-29 of the specification. While the specification (and the drawings) does show a single initial correlator (i.e., 2-view image comparator) (See page 16, lines 19-20), the specification does not show a plurality of correlators. Appropriate correction is required.

2. Since claims 2-8 directly or indirectly depend on claim 1, they are also objected to for the same reason set forth above for claim 1. Appropriate correction is required.

3. While claim 14 recites the limitation “determining a first correspondence comprises the step of producing a first likely match set of distinct image features that is determined to have a *maximum average strength of correspondence based at least in part on a total number of matching neighbor distinct image features* (emphasis added) for each match of the first likely match set”, the specification says nothing about determining maximum average strength of correspondence based at least in part on a total number of matching neighbor distinct image features. A similar limitation also occurs in claims 6 and 22. Also, claim 15 recites the limitation “computation of reprojection error for matched distinctive image points that results from a projective reconstruction of the at least a second potential match set”, and the specification says nothing about this feature. A similar limitation also occurs in claims 7 and 23;

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and claim 16 recites the limitation “a second potential match set is based at least in part on a least median of squares computation of the reprojection errors related to matched distinctive image points in the at least a second potential match set”. Again, the specification says nothing about this feature. A similar limitation also occurs in claims 8 and 24. Appropriate correction is required.

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 9-13 and 17-21 are rejected under 35 U.S.C. 102(e) as being anticipated by Zhang, et al. (6,606,406).

Before advancing the detailed claim rejections, it will be helpful to briefly describe the progressive stereo matching of digital images that represent a scene of Zhang, et al. At column 8, lines 2-17, Zhang, et al. uses a progressive iterative process to determine a set of previous unambiguous (i.e., reliable) pixel matches, define a search range based on this set of previous unambiguous pixel matches, search for current unambiguous pixel matches within the search range and append current unambiguous pixel matches to the set of previous unambiguous pixel matches. This iterative process of increasing the set of previous unambiguous pixel matches by appending current unambiguous pixel matches and redefining the search range based on the set of previous unambiguous pixel matches continues until suitable matching has been achieved.

The iterative process of the present invention progressively finds more and more unambiguous pixel matches and dynamically defines a search range based on these reliable pixel matches to reduce potential false matches and increase reliability and efficiency.

With regard to claim 9, a method of matching image features between a plurality of images, i.e., images 1-3 (See for example, Fig. 2), the method comprising the steps of: detecting a first set of distinct image features, i.e., points, in a first image of a first plurality of images, wherein the plurality of images comprises images of a scene that were contemporaneously captured from different physical locations which are not known a priori (as illustrated in Figs. 2 and 7; and col. 6, lines 63-64); determining a first correspondence, i.e., match or correlation, of distinct feature images between the first set of distinct image features and at least a second set of distinct image feature detected within at least a second image of the first plurality of images (See for example, col. 8, lines 18-45); and determining a final correspondence, i.e., suitable match, of distinct image features detected in a second plurality of images, including the first image and the at least a second image, within the first plurality of images (See for example, col. 8, lines 46-57).

With regard to claim 10, a method according to claim 9, wherein distinct image features are feature points (See for example, Fig. 7).

With regard to claim 11, a method according to claim 9, wherein the steps of the method are performed repeatedly, i.e., iteratively, to process real-time video data (See for example, item 470, in Fig. 4).

With regard to claim 12, a method according to claim 9, wherein the step of detecting and the step of determining a first correspondence are performed in a first processor that is associated

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with a camera which captured the first image (See for example, item 240:330, in Fig. 3; and col. 6, lines 43-46).

With regard to claim 13, a method according to claim 12, wherein the step of determining a final correspondence is performed in a second processor (See for example, item 240:340, in Fig. 3).

Claim 17 is rejected the same as claim 9. Thus argument analogous to that presented above for claim 9 is equally applicable to claim 17. Zhang, et al. further discloses a computer readable medium including computer instructions for matching image features between a plurality of images (See for example, item 104, in Fig. 1).

Claims 18, 19, 20, and 21 are rejected the same as claims 10, 11, 12, and 13 respectively. Thus, argument similar to those presented above for claims 10, 11, 12, and 13 are respectively applicable to claims 18, 19, 20, and 21.

### ***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang, et al (6,606,406).

Claim 1 is rejected the same as claim 9 except claim 1 is an apparatus claim. Thus, the

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arguments presented above for claim 9 are not repeated herein but are incorporate by reference. Assuming applicant will overcome the objection indicated above in paragraph 5, claim 1 further distinguishes from claim 9 only in that it recites a plurality of a plurality of image feature detectors, a plurality of initial image correlators, wherein each initial image correlator within the plurality of initial image correlators is communicatively coupled with at least one of the image feature detectors within the plurality of image feature detectors, a final image correlator communicatively coupled with each of the plurality of initial image correlators which are not expressly taught by Zhang, et al. Instead, the system of Zhang, et al uses a progressive stereo matching of multiple images by using a single processor. What this means is that Zhang, et al obtains a plurality of correlations until it reaches a suitable, i.e., final, match by using a single feature detector, i.e., camera, a single processor that generates an initial match or correlation between images and generates the final match or correlation (suitable match) using the same processor. Although Zhang, et al. does not expressly provide a plurality of feature detectors and initial correlators, it would have been an obvious matter of design choice to modify the plurality of feature detectors and initial correlators by using a single feature detector, i.e., camera, and a single processor, i.e. stereo matcher or correlator as taught by Zhang, et al. (See Figs. 2 and 3) col. 1, lines 36-44) to determine an initial and final correspondences, since no new or unexpected results are seen to be attained by providing a plurality of feature detectors and initial correlators, and it appears that the single camera and single processor would equally generate an initial match and a final match between multiple images.

With regard to claim 2, an image processing system according to claim 1, wherein distinct image features are feature points (See for example, Fig. 7).

With regard to claim 3, an image processing system according to claim 1, wherein each image within the first plurality of images and within the second plurality of images is one image within a real time motion picture (See for example, Fig. 8).

With regard to claim 4, an image processing system according to claim 1, wherein a first image feature detector within the plurality of image feature detectors and a first initial image correlator within the plurality of initial image correlators (item 240, in Fig. 3) are communicatively coupled to a first digital processor that is communicatively coupled to a first camera for capturing at least one image of the plurality of images (See for example, col. 6, lines 43-46; and Item 143, in Fig. 1).

With regard to claim 5, an image processing system according to claim 4, wherein the final image correlator is communicatively coupled to a second processor (which corresponds to item 240, in Fig. 3).

### ***Conclusion***

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US Patent Numbers: 4193117, 4244029, 4864629, 5406642, 6516099, 6556692, 6584224, and 6701005; a publication to Mazzoni, et al. "Stereocorrelation on the parallel OPENVISION system".

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL G MARIAM whose telephone number is 703-305-4010. The examiner can normally be reached on M-F (7:00-4:30) FIRST FRIDAY OFF.



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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, LEO BOUDREAU can be reached on 703-305-4607. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
DANIEL MIRIAM  
PRIMARY EXAMINER

November 18, 2004